DOCUMENT RESUME

ED 468 490 TM 034 400

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TITLE	A Model for Technovocational School-Based Curriculum Planning and Evaluation under the Framework of Total Quality Management.
PUB DATE	2002-08-00
NOTE	21p.
PUB TYPE	Reports - Descriptive (141) -- Speeches/Meeting Papers (150)
EDRS PRICE	EDRS Price MF01/PC01 Plus Postage.
DESCRIPTORS	*Curriculum Development; Educational Planning; Elementary Secondary Education; Models; Program Implementation; *Technological Advancement; *Total Quality Management; *Vocational Education

ABSTRACT

In the current climate of rapid technological advance and social value change, many have suggested that schools should use a school-based approach to curriculum planning. How to design such a curriculum in order to train graduates suited for employment has become an important issue. Many domestic and international enterprises have successfully applied total quality management (TQM) to enhance the quality of their services and products. This article discusses the challenges that may be encountered in school-based curriculum design and implementation. Then a systems approach is used to construct, considering strategic and technical aspects, a model for curriculum planning and evaluation for reference by school organizations. The model consists of five stages, each of which is further divided. These stages are: (1) preparation; (2) design; (3) development; (4) implementation; and (5) evaluation. This comprehensive system emphasizes a customer-needs orientation and continuous evaluation and improvement. (Contains 1 figure and 34 references.) (SLD)

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A Model for Technovocational School-Based Curriculum Planning and Evaluation under the Framework of Total Quality Management

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Abstract

Under the current course of rapid technology advances, dramatic industrial changes, and social value systems becoming further diversified, many specialists and scholars have suggested that, in order not to be disconnected with the needs of the society and industry, schools should employ a school-based approach for curriculum planning. As such, it has become an important issue as to how a school can design a proper curriculum for training of graduates desirable by the industry. Many domestic and international enterprises have successfully applied total quality management (TQM) to enhance the quality of their services and products. This article discusses the challenges that may be encountered in school-based curriculum design and implementation. Then, based on the characteristics of TQM, a systems approach is followed to construct, considering both the strategic and technical aspects, a model for curriculum planning and evaluation for reference by pertinent school organizations.

Keywords: Total Quality Management, Curriculum Planning

TM034400

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I. INTRODUCTION

A. Motive for Research and Background

Curriculum is the main contents of education of all levels of schools. Not only does the achieving of the objectives of the education of a school depend on the planned curriculum, but also the curriculum guides the selection of the teaching staff and their on-the-job training. Furthermore, the acquiring of equipment and setting up of labs must be guided by it. Therefore, in the current era that is characterized by rapid technology advances, drastic industrial changes, student demands more and more diversified, teachers' demand for democracy higher and higher, and the internal and external environments of a school turning more and more complex, many scholars have suggested that, in order to train students meeting the modern needs, the development of curriculum must be school-based (Huang and Chang, 1999).

By school-based curriculum development, it basically means to conduct a school's curriculum planning, design, implementation, and evaluation with emphasis on the school's educational vision and on the needs of the students and the society. Such curriculum development is centered on the school and is founded on the teaching body of the school (Kao, 1999). According to the study by Marsh (1992), most of the various levels of educational institutions and teachers in many advanced countries (such as the United States, England, Australia, and Canada) are receptive and agree to the approach of school-based curriculum development. Such approach has, in fact, become the mainstream of curriculum development. When a school and its teachers are autonomic in deciding the curriculum, as long as the teachers can properly apply their professional knowledge in curriculum planning and design, they can tailor develop a curriculum program that meets the school's and the students' specific teaching and

the studying situations (Sabar, 1985; Kao, 1999), which, in turn, can enhance the effectiveness of the students' study.

Numerous studies have pointed out the many advantages of school-based curriculum development; however, on the other hand, evidence shows that the quality of curriculum planning can be compromised because of a multitude of factors, including the willingness, buy-in, and planning knowledge of the teachers, the leadership and the organizational atmosphere of the school, funding, human resources, empowerment, time, lack of administrative support and an evaluation mechanism, and the cooperative attitude of the overall societal environment (Chang, 1998; Chen, 2001).

Since the inception of total quality management (TQM), it has thus far been developed to have a rather complete framework. Its characteristics include: (a) goal setting, (b) customer-orientation, (c) continuous improvement, (d) total participation of organization, (e) process-orientation, (f) prevention over correction, (g) systematic, (h) cooperation through division of work, and (i) guidance and motivation of management (Yang, 1998). Therefore, it is believed that schools should consider taking advantage of the characteristics of TQM to construct a school-based model for curriculum planning and evaluation that covers both the strategic and technical aspects and that is in tune with curriculum development theories. Furthermore, to tackle issues and difficulties that may be encountered, an in-depth analysis and study must be conducted.

II. Issues Encountered in Current Curriculum Planning and Implementation

At present, although most of the schools have formed curriculum planning committees or curriculum development committees to conduct related work, many issues remain to be overcome in actual planning and

implementation (Chen, 2001; Wang, 2000; Huang, 2000; Chang, et al., 2000; Lee, 1999; Tu and Chang, 1999; Chang, 1998; Chang, 1996). A list of the issues is as follows:

(1) Faculty's buy-in and their knowledge and skills: Curriculum development and planning is a process that requires careful thinking and painstaking preparation. It is difficult for a faculty without plenty of curriculum design understanding and the necessary professional training of relevant fields to develop a curriculum that meets the need of the industry, satisfies the interests of the students, reflects the uniqueness of the school, and promotes the willingness to study. Furthermore, if the faculty, for various reasons, does not have the buy-in of the school-based curriculum planning approach, resistant psychology among the faculty against the planning and implementation of the curriculum may develop that may make curriculum development difficult.

(2) School leadership and organizational atmosphere: Throughout the course of curriculum development, a great deal of interaction, coordination, communication, and cooperation among people is required. If the leadership of the school appreciates the importance of school-based curriculum planning and, accordingly, cultivate a commensurate environment on the campus, it will help a smooth progress of curriculum development.

(3) Lack of resources: Curriculum development is a planned dynamic task. It requires the school's long-term, sustained investment of funding, time, and human resources. Therefore, if the school adequately provides, administratively, empowerment and support and actively seeks resources from the society and industry, it will help the curriculum development.

(4) Lack of an effective mechanism for curriculum evaluation: Many schools have not yet developed a mechanism for evaluating

curriculum programs. Therefore, there is no way of evaluating the planning and implementation of the curriculum. There are also schools that have established an evaluation index to evaluate curriculum programs, but they may not have properly taken advantage of the feedback function and provided the results to the pertinent organizations in the school as a basis for improvement.

(5) Rapid industrial changes: In order to face the current rapid technological advances and fast-changing industrial structures, the planning of the curriculum structure must allow flexibility, so as to be able to be adjusted to meet the needs of the industry. For example, the practicum courses for mechanical engineering department or division should have the emphasis placed on CNC, CAD/CAM, automatic control, and electromechanical integration. The practicum course of metal work that is not part of the high-tech industry or most of the mechanical plants can consider to be eliminated or be integrated into another course as one of the units of the fundamental study.

(6) Professional growth of teachers: From the standpoint of a teacher's professional growth, the maturing, growth, and socialization of the teacher take shape gradually mostly subsequent to his/her joining the school and beginning actual teaching. In this age of drastic societal changes and rapid technological advances, it has become an issue that deserves attention as to how to, through curriculum planning and the teachers' participation, coordinate the teachers and the administrative units of the school and achieve the development of a model and method for enhancing the professional growth of the teachers and for elevated teaching effectiveness.

III. Literature Survey

A. TQM Applied in the Field of Education

Since the inception of the concept of TQM in 1930s, it has been promoted and furthered by a number of quality control masters, including Shewhart, Deming, Crosby, Juran, and □□□ of Japan. Upon applying TQM, many organizations, including those in the manufacture sector, service industry, medical industry, and educational industry, etc., increased not only the organizational productivity and efficiency, which, in turn, satisfied the needs of the customers, but also the organizational future competitive advantages (Tang and Lee, 1998). Presently, TQM has become a common, industry recognized model of quality management in advanced countries, such as the U. S. and Japan. In Taiwan's management environment, which is full competition, the application of TQM activities has, in recent years, been such an important strategy for quality improvement. Many technical and vocational colleges in Taiwan's educational sector have introduced the TQM concept and activity. The fundamental concept of TQM includes leadership of the management, customer satisfaction, continuous improvement, and total organizational participation (Dai, 1996). To put to actual use, TQM includes the following key areas (Chao, 1995; Yang 1998; Hung and Su, 2000):

(1) Setting customer-oriented quality goals;
(2) Total organizational participation;
(3) Continuous improvement;
(4) Placing emphasis on systemized operation;
(5) Prevention more important than correction;
(6) Sufficient communication;
(7) Cooperation by work division and empowerment;
(8) Method of evaluation and feedback;
(9) Quality improvement and technology;
(10) Leadership and motivation of management.

Furthermore, during the course of executing TQM, the repeating cycles of the PDCA

(Plan, Do, Check, and Action) system is emphasized. Thus, any activity in an enterprise must cyclically apply the four steps of plan, do, check, and action. These four steps, therefore, form a system of continuous managing and improving.

In recent years, many domestic and overseas scholars consider applying TQM in education management a good approach for schools seeking quality excellence and have proposed insightful views. For example, Lin (2000) has proposed that, to apply TQM in higher education, a vigorous organization and management structure must first be planned, followed by working with the various levels of education and views of the entire school's employee body for a concerted decision-making effort. Hoffherr, et al. (1994) have proposed that TQM forms a structured system required for allowing active employee participation in planning and for continuous improving the satisfaction of customer's needs. Sallis (1993) considers TQM a philosophy of continuous improvement that provides any educational institute a series of practical tools to meet and exceed the present and future needs and expectations of the customers. Wu (1996) proposes that, to apply TQM in education, the following must be emphasized: (1) focusing on the needs of those who receive the education service, (2) the school system must be continuously improved, (3) schools must promote a quality culture, and (4) the support and participation of senior leadership. Some scholars (Chao, 1995; Lin, 2000; Hsu, et al. 2000) further consider application of TQM can enhance the performance of the school and establish a school of higher efficiency, which, in turn, can provide students the best learning opportunities.

IV. Applying TQM in Curriculum Planning

A. The Strategic Application of TQM

The underlying strategy of TQM is to create a rationalized procedural flow process through systemized planning (Chao, 1998). To apply the strategy of TQM to curriculum development, the following steps may be taken:

(1) Establish school-, college-, and department-level, curriculum planning committees

The process of technovocational school-based curriculum planning places heavy emphasis on the expertise and participation of teachers. Therefore, it is appropriate for curriculum to be planned on a department-level basis. Through adequate communication and discussion, each department will submit its planned curriculum to college- or school-level curriculum planning committee for final tuning and approval.

(2) Systematically collect relevant information

Prior to launching curriculum planning, individual curriculum planning committees must systematically gather relevant information, such as gathering information on change of the industry structure and demand for human resources, analyzing the student source and their comprehensiveness, and understanding the curriculums offered in upstream and downstream technovocational schools. Such information will become the basis for designing curriculums appropriate for training individual department students for consistent fundamental professional and common knowledge.

(3) Set curriculum quality goal management plans and timetables

Individual levels of curriculum planning committees should, under the guidance of the educational goals of the school/individual departments, set curriculum quality goal management plans that are industry need-oriented and that reflect the resources of the school and the society. Such plans will include short-term, annual, and mid- and long-

term objectives. Moreover, in order to achieve these objectives, necessary package approaches and mechanisms for evaluation and feedback must be made.

(4) Conduct school-wide training for communication and education

Since the school-based curriculum planning and the related promotional activities are likely to exceed the teaching responsibilities and work experience for most of the teachers in the school, they may create the teachers' resisting or not-willing-to-cooperate mentality. Therefore, viewing from the angle of prevention better than curing, the school needs to hold seminars and/or training sessions to establish common recognition and the concept and skills of quality management among the teachers.

(5) Conduct continuous evaluation and improvement activities

At the current juncture of seeing rapid changes in technology, industry, economy, and social value systems in Taiwan, continuous improvement activities have become the focus of TQM activities. So, it has become an important part in curriculum development to incorporate the system concept of PDCA continuous cycle in order for building a curriculum evaluation index and a mechanism for feedback and modification.

(6) The persistence and leadership of supervisors

In order to achieve technovocational school-based curriculum planning, supervisors of all levels must participate in person throughout the process, offer full support, promote the cause, and provide supervision. As such, the curriculum planning and development in the school can be advanced successfully.

B. The Application of TQM Techniques and Methods

The fundamental principle of TQM is philosophical. However, in order for the characteristics of TQM firmly settle into the process of technovocational school-based

curriculum development, appropriate training must be conducted so that the school staff members may be familiar with the methods and techniques frequently used in TQM implementation. Example methods and techniques include:

(1) Cause-and-Effect Diagram

Cause-and-effect diagram is also known as fish-bone diagram. It can help in the operation of an organizational model to find out the cause-and-effect relationship of incidents and define primary responsibility factors and secondary factors. Some scholars (Rau and Chou, 1997) used this diagram for establishing the structure of core and elective courses for business management department of a vocational school.

(2) Quality Function Development (QFD)

QFD can be used for systematic converting the needs of customers into quality characteristics of products or services. It can be used for projecting the quality standard of a product or service. Some scholars (Chao, 1995; Liu, et al. 2000) used this method for investigating the conversion relationship between the needs of industry and a curriculum and for constructing teaching quality measuring models.

(3) Matrix Diagram

Matrix diagram can help an organization establish and manage the relationship among factors through multivariable consideration. It can be applied to reveal hidden issues. It is particularly effective in identifying issues caused by interaction of various factors. Huang (1996) used a T-matrix diagram for conducting curriculum design.

(4) Brain Storming

Brain storming is a way of solving problems, investigating causes, or seeking for resolution by collective creation and thinking. Some Scholars (McClanahan & Wicks,

1994) applied this method in teaching to induce student's creativity.

(5) Quality Control Circle (QCC)

A QCC is a small group that promotes PDCA in the industry. Members (about 5 to 15 people) of the group would take initiative to identify and investigate potential problems within their expertise work area. They also would try to improve or solve the problems. Chung (1997) proposed that teachers of individual departments form small groups similar to QCCs to seek for improvement on method of teaching, student counseling, and even curriculum planning, by way of self-management through gathering relevant information on their own and holding meetings for discussion of strategies. However, members of a QCC had better be familiar with the application of simple quality control techniques, such as Plato checklist, cause-and-effect diagram, and brain storming meeting method. If a proposing system and a parallel reward system are instituted in the QCCs, the function of QCCs can be further enhanced.

(6) Histogram

Histograms are bar diagrams that show the dispersion or distribution of variables. They allow the readers to easily and clearly see the variation of variables. Some scholars (Murgatroyd and Morgan, 1993) applied histogram to illustrate the projected target students or a team should have achieved.

(7) Scatter Diagram

Scatter diagram is a tool for analyzing the relationship between two variables. It can be used for identifying the cause-and-effect relationship of the factors throughout a processto help to show the possible root cause of a problem. Bostingl (1992) utilized this diagram to demonstrate the correlation between student study time and examination results.

(8) Establishment of Quality Control Documentation and System

ISO 9000 series, for example, is a quality management system standard commonly recognized by many industries. It is one of the effective ways for a business to achieve TQM. Research (Chen, et al., 2000) has shown that many technical schools in Taiwan have introduced this system and significant improvements are seen in enhancing the quality of education.

There are many tools and techniques for quality management. The ones described above are only several of them. However, since these several possess the characteristics of being simple, easy to understand, and easy to apply, they can be easily taught and promoted in training. If properly utilized in curriculum planning, they can not only help in information gathering and analysis and in related decision-making, but also enhance the quality and effectiveness of curriculum development.

V. Curriculum Planning and Evaluation Model

Based on the investigation above, this study proposes a school-based model, shown in Figure 1, for curriculum planning and evaluation that enhances the sense of participation in such planning on the part of the teachers and that enhances the quality and effectiveness of such planning.

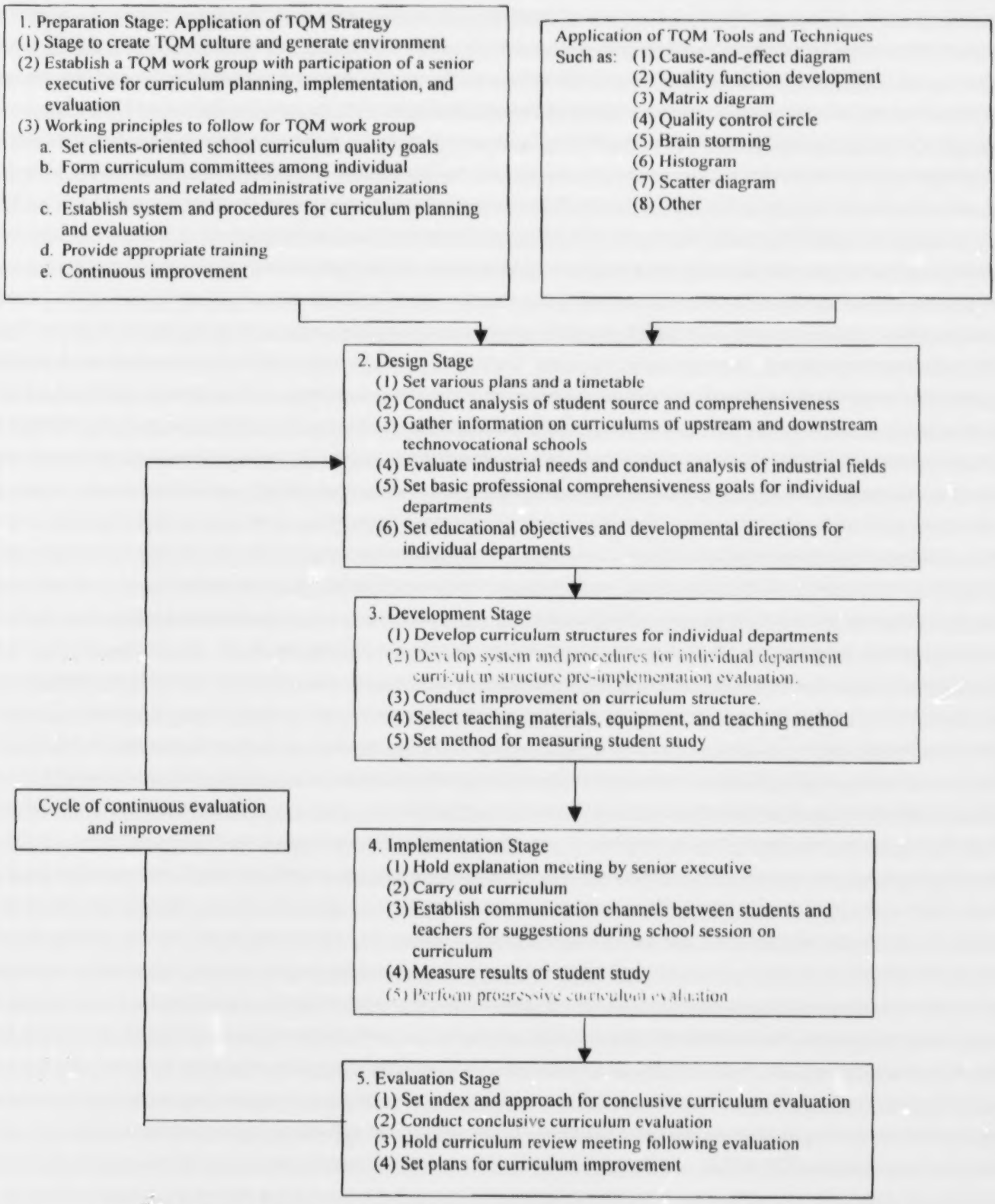
1. Preparation Stage: Application of TQM Strategy
(1) Stage to create TQM culture and generate environment
(2) Establish a TQM work group with participation of a senior executive for curriculum planning, implementation, and evaluation
(3) Working principles to follow for TQM work group
a. Set clients-oriented school curriculum quality goals
b. Form curriculum committees among individual departments and related administrative organizations
c. Establish system and procedures for curriculum planning and evaluation
d. Provide appropriate training
e. Continuous improvement
Application of TQM Tools and Techniques
Such as: (1) Cause-and-effect diagram
(2) Quality function development
(3) Matrix diagram
(4) Quality control circle
(5) Brain storming
(6) Histogram
(7) Scatter diagram
(8) Other
2. Design Stage
(1) Set various plans and a timetable
(2) Conduct analysis of student source and comprehensiveness
(3) Gather information on curriculums of upstream and downstream technovocational schools
(4) Evaluate industrial needs and conduct analysis of industrial fields
(5) Set basic professional comprehensiveness goals for individual departments
(6) Set educational objectives and developmental directions for individual departments
3. Development Stage
(1) Develop curriculum structures for individual departments
(2) Develop system and procedures for individual department curriculum structure pre-implementation evaluation.
(3) Conduct improvement on curriculum structure.
(4) Select teaching materials, equipment, and teaching method
(5) Set method for measuring student study
Cycle of continuous evaluation and improvement
4. Implementation Stage
(1) Hold explanation meeting by senior executive
(2) Carry out curriculum
(3) Establish communication channels between students and teachers for suggestions during school session on curriculum
(4) Measure results of student study
(5) Perform progressive curriculum evaluation
5. Evaluation Stage
(1) Set index and approach for conclusive curriculum evaluation
(2) Conduct conclusive curriculum evaluation
(3) Hold curriculum review meeting following evaluation
(4) Set plans for curriculum improvement

Figure 1. Technnvocational school-based curriculum planning and evaluation model.

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The structure of this model consists of 5 stages. Each stage is further divided into several steps. The implementation of each stage can employ appropriate TQM tools and techniques for improving curriculum planning quality and effectiveness. The feedback on strengths and weaknesses during implementation will, then, be used for each stage for necessary modification, based on the continuous evaluation and improvement principle of TQM. Upon meeting and discussion among specialists, this model is found to have the following characteristics:

1. It forms a comprehensive system, covering stages of preparation, design, development, implementation, and evaluation and improvement of curriculum development. It emphasizes the PDCA exercise of TQM and it incorporates a feedback mechanism.

2. This model is about school-based curriculum planning. It encourages the participation of the entire faculty body by setting an award system, by which teachers are promoted to participate deeper and are empowered more broadly in curriculum planning decision-making. As such, the implementation resistance can be expected to subside and the educational goals achieved more readily.

3. It emphasizes customer-needs orientation. Throughout the course of curriculum planning, not only must the internal and external customer needs of the school be considered, but also the industrial manpower needs must be assessed and industries themselves analyzed. Only so can the contents of the curriculum be integrated with the technovocational school characteristics.

4. It emphasizes continuous evaluation and improvement. When changes take place in any of the sectors of customers, technology, and industry,

the structure and contents of curriculum can be timely evaluated and modified.

VI. Conclusions and Recommendations

The "school-based" curriculum development mentioned in this article is aimed, primarily, at achieving the school's education goal. It is driven by the internal and external customer needs of the school and is focused on students. Furthermore, it is centered on the school's individual departments and it unites the school's staff and the internal and external resources for achieving the activity of curriculum planning, evaluation, and improvement. In light of the difficulties schools face at the present time when performing curriculum planning, this study, incorporating the TQM theory, recommendations out of meetings of specialists, and practical considerations, proposes a model for curriculum planning and evaluation.

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EFF-088 (Rev. 9/97)